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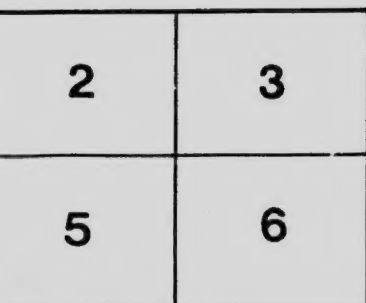
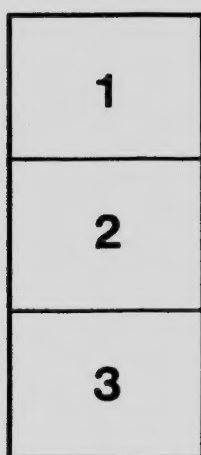
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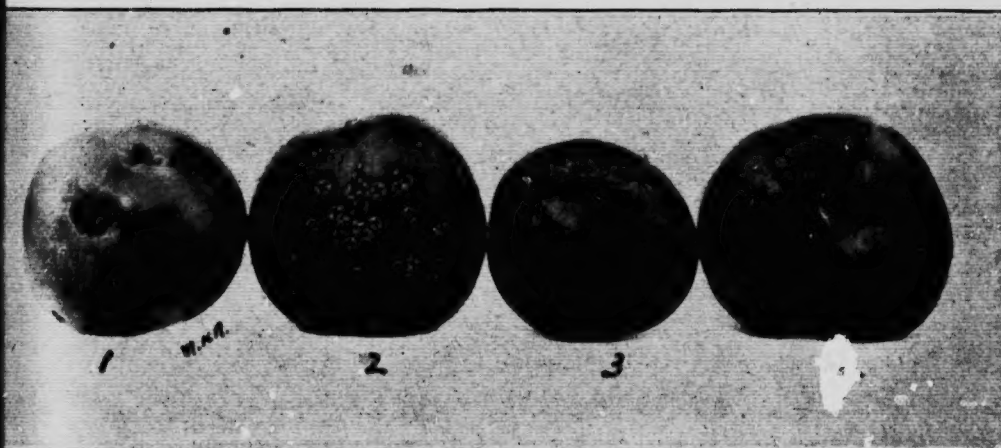


## PROVINCE OF BRITISH COLUMBIA.

DEPARTMENT OF AGRICULTURE  
(HORTICULTURAL BRANCH).

### APPLE-SCAB.

**T**HIS is a fungus-disease. The dark olive-green to almost black masses of mycelium and spores form conspicuous spots on the leaves, flowers, flower-stalks, and fruit. More rarely the young twigs are attacked. Badly attacked leaves turn yellow and fall prematurely, thus weakening the tree. Non-setting of the fruit may result from infection of the flower-stalks. The best-known form of the disease, however, is on the fruit, which if slightly affected is blemished with black spots, and if severely attacked is stunted, malformed, and worthless commercially. Badly attacked fruit often cracks open, thus becoming easily attacked by rot fungi.



Apples affected with scab. No. 2 shows the skin of the apple, split off from the underlying tissue, persisting round the edge of the fungus-spot. No. 3 shows the cracking which often supervenes. Both 3 and 4 show malformation as a result of scab-infection.

The severity of the disease varies according to climatic conditions. Where there is much rain during the growing season, especially rain followed by close, muggy weather, which hinders the drying-off of the trees, scab is likely to be bad. In the Island, Coast, Salmon Arm, and Kootenay sections it has to be reckoned with as a constant factor. In the irrigated areas it becomes less severe. At Vernon it affects chiefly the most susceptible varieties, but may become epidemic in some seasons. From Summerland south to Keremeos it may be said to be unknown.

#### Varietal Differences.

McIntosh Red and Fameuse (Snow) are undoubtedly the most susceptible. Yellow Newtown, Gravenstein, and Winter Banana also scab badly, while Blenheim Orange and Ontario are somewhat resistant. Aside from the first two, however, it is doubtful if the difference between one variety and another is sufficient to make much difference in the care required. In a bad season the more resistant will scab considerably if unsprayed, while the more susceptible will be protected by proper spraying. McIntosh or other susceptible varieties should not be planted in districts where scab is bad, unless the grower is prepared to go to considerable trouble and expense in spraying.

#### Control Measures.

The disease is spread by the spores of the fungus falling on the leaves, fruit, etc., when, if conditions are right, germination takes place, and the fungus enters into the outer tissues. An essential condition for this is that the germinating spore shall be kept moist for two or three days. A very thin film of water is all that is necessary, but it must be present continuously. Anything, therefore, which assists in drying the trees after rain is of value. Proper air-drainage to the orchard, pruning to open up the tree, and thinning of the fruit are all of importance in this way.

The first infection with the disease in spring comes from spores produced in old infected leaves left lying on the ground during the winter. If it is possible, therefore, to plough these under before the buds break in the spring, much infection will be prevented. For the same reason it may be expected that the effects of proper control measures will be cumulative, as the amount of infected leaves will be reduced.

Although all these things are of importance, the apple-grower's chief defence is in proper spraying. The object of this is to coat the entire susceptible surface of the tree with a thin layer of some material through which the germinating fungus cannot penetrate, but is killed. Spraying is of no use once the fungus has got inside

the cells. A scab-spot can be dipped in or covered with a strong fungicide, and the fungus will go on growing in the cells below. The vital point, therefore, if spraying is to be effective, is to have the spray covering the surface before the spores fall on it. It follows also that the spraying will have to be renewed according to the rapidity with which it is washed off, and that it must be done very thoroughly if all parts are to be so completely covered that there is no uncovered spot left which is large enough to accommodate a fungus-spore. The choice of a fungicide practically lies between Bordeaux mixture and lime-sulphur solution. The former, however, is very liable to seriously blemish the fruit by "russetting," and is hence not much used at the present time.

Experimental work conducted at various points in the Province has shown that three sprayings properly given will control scab on the most susceptible variety (McIntosh) in an ordinary season. These are indicated by heavy type in the list. Fewer sprayings do not give adequate security, although in some seasons two prove sufficient. Unfortunately, it is not possible to forecast the weather



**First Spray.**



**Second Spray.**

far enough ahead to say in advance when the two only are going to be enough. In very wet seasons additional sprayings might be worth while. Spraying before the buds break is practically worthless against scab.

#### **Sprayings.**

(1.) *Semi-dormant*.—When the first leaves are about the size of a 10 cent piece. Has proved of value in some cases in preventing



early infection. To be recommended when the opening of the buds extends over a long period owing to cold and wet weather. Use lime-sulphur concentrate 1 to 30.

(2.) *Pink Spray*.—When the blossom-buds are well separated in the cluster and showing pink, but before the blossoms open. Protects the flower-stalks as well as foliage. Use lime-sulphur 1 to 35.

(3.) *Calyx Spray*.—As soon as the petals have fallen. Use lime-sulphur 1 to 35 or 40.



Third Spray.



Fourth Spray.

(4.) About two weeks later. Use lime-sulphur 1 to 35 or 40. The exact time after No. 3 will vary according to season. It may be better to make it ten days if the weather is wet, whilst it may be deferred for three weeks under the opposite conditions.

(5.) An additional spray from ten days to three weeks later. This, under British Columbia conditions, however, is rarely necessary.

The time to spray is not a matter of dates, but of the stage of seasonal growth. The illustrations indicate the correct stages for the different sprays.

#### Pear-scab.

This is identical with apple-scab in appearance and effects. The fungi, however, are considered to be distinct, since it has been found impossible to produce pear-scab with the fungus from the apple, and *vice versa*. Pear-scab in this Province is not nearly so serious a disease as apple-scab. Flemish Beauty, however, is an excep-

ingly susceptible variety, and should not be grown in areas where scab is severe. For other varieties the three sprayings recommended for apple-scab will probably be found quite satisfactory.

### Results of spraying at Nelson, B.C.



Fifty worst apples from unsprayed and sprayed trees. Respective weights, 3 lb. and 9 lb.



Sixty best apples from same trees. Respective weights, 13 lb. and 19 lb.

## Insecticides.

Other circulars are published dealing with insect pests. It is sufficient to state here that if aphides are present when any of the above sprays are applied, Black Leaf 40, or other 40-per-cent. nicotine preparation, should be added at the rate of  $1\frac{1}{2}$  to 2 pints to each 200 gallons of diluted spray. For bud-moth or leaf-eating caterpillars arsenate of lead, at the rate of 2 lb. of the paste to 40 gallons, should be added. Both these may be added if required, and increase rather than diminish the fungicidal power of the lime-sulphur.

Two similar trees of McIntosh, one sprayed three times as here recommended, and the other unsprayed, gave the following results:—

|                | No of Apples. | Total Weight. | Weight, clean. | Weight, scabby but marketable. | Weight of 50 best. | Weight of 50 worst. | Decrease in Weight due to Scab. |
|----------------|---------------|---------------|----------------|--------------------------------|--------------------|---------------------|---------------------------------|
|                |               | lb.           | lb.            | lb.                            | lb.                | lb.                 | Per Cent.                       |
| Unsprayed..... | 459           | 65            | None.          | 13                             | 11                 | 3                   | 73                              |
| Sprayed.....   | 611           | 143           | 89             | 30                             | 16                 | 9                   | 44                              |

Even better results were obtained at other points.

## APPLE-SCAB CONTROL.

Demonstrations at Nelson, Creston, and Forslund's, 1917.

| Sprays.              | Plot 1.   | Plot 2.   | Plot 3.   | Plot 4.   | Plot 5.   | Plot 6.   | Plot 7. |
|----------------------|-----------|-----------|-----------|-----------|-----------|-----------|---------|
| Delayed dormant..... | L.S. 1-25 | L.S. 1-25 | L.S. 1-30 | .....     | .....     | .....     | Check.  |
| Pink.....            | L.S. 1-30 | .....     | L.S. 1-35 | L.S. 1-30 | L.S. 1-30 | L.S. 1-30 | Check.  |
| Only.....            | L.S. 1-35 | L.S. 1-35 | L.S. 1-35 | L.S. 1-35 | L.S. 1-35 | L.S. 1-35 | Check.  |
| 14 days later.....   | L.S. 1-35 | L.S. 1-35 | L.S. 1-35 | L.S. 1-35 | .....     | .....     | Check.  |
| 14 days later.....   | L.S. 1-35 | L.S. 1-35 | L.S. 1-35 | .....     | .....     | L.S. 1-35 | Check.  |

Cost at Nelson (hand-pump),  $7\frac{1}{2}$  cents per spraying per tree; cost at Creston (power-pump),  $15\frac{1}{2}$  cents per spraying per tree; cost at Forslund's (power-pump), 8 cents per spraying per tree.

Number trees in experiments: Nelson, 79, Creston, 38; Forslund's, 29. All trees of full bearing age.

Amount of diluted spray used per tree per spraying: Nelson, 2.3 gallons; Creston, 4 gallons; Forslund's, 2.8 gallons.

At Nelson and Forslund's home-made lime-sulphur was used, while at Creston the commercial lime-sulphur was used. Cost of home-made lime-sulphur, 12 to 15 cents per gallon; cost of commercial lime-sulphur, 37 cents per gallon.

### **Results on McIntosh.**

Plots 1, 2, 3, 4, 5, and 6 at Creston, fruit practically 100 per cent. clean.

Plots 1, 3, 4, 5, and 6 at Forslund's, fruit over 94 per cent. clean and 100 per cent. marketable. Plot 2 only 72 per cent. of fruit clean.

Plots 1, 2, 3, and 4 at Nelson, fruit 72, 50, 52, and 58 per cent. clean respectively and over 84 per cent. marketable. Plots 5 and 6 gave poor results.

Plot 7 (check) at Nelson, fruit 100 per cent. scabby; at Forslund's, 78 per cent. scabby.

### **Facts demonstrated.**

Lime-sulphur did not injure the fruit when applied at the above strength. The sprayed trees were heavier set with fruit than the unsprayed trees.

Lime-sulphur caused some burning to the foliage, but the scab will cause more injury to the leaves than the burning caused by the spray.

Lime-sulphur, when applied at the above strengths three times or more, will give good commercial results. This year at Creston and Forslund's two sprays applied thoroughly gave good commercial results.

The apple-scab is most easily controlled where the trees are well cultivated, well pruned, and planted at a good distance apart.

That the delayed dormant spray has proven quite an important spray in the control of scab in badly infected orchards.

Spraying means the difference between commercial fruit and culls, or profit and loss.

That the size of the fruit borne is greatly increased by spraying. The increase in weight will pay for the cost of spraying.

Pump should be low, light, and strong, with effective parts made of brass or non-corrodable material. It should have a good-size air-chamber. Use good hose at least 50 feet in length, and rolls as light as possible. Use an angle on your nozzles. Use a Bordeaux or driving type of nozzle for the first two sprays, and a Friend or mist type of nozzle for the later sprays in the foliage.

*It will pay to make lime-sulphur at home.* Formula: 50 lb. of good fresh stone-lime; 100 lb. of sulphur, and 50 to 60 gallons of water.

Put about 10 gallons of water in the boiling outfit and start the fire. While the water is heating up, put in the sulphur and stir well to break up the lumps. Add the remainder of the 40 or 50 gallons of water, and when about ready to boil put in the lime. Keep the contents well stirred while the lime is slaking. This will prevent caking on the bottom, and at the same time will keep the lime and sulphur in suspen-



sion until they are in solution. The boiling should be continued for about an hour, adding water from time to time to keep the total up to 50 gallons.

Use a hydrometer to test the strength of the concentrated solution to determine the proper amount of dilution for each spraying.

**Table for Diluting Concentrated Lime-sulphur Solutions.**

| Hydrometer Test of Concentrate. |                   | To the following amounts of water add one gallon of the concentrated solution. |                         |                          |                          |                         |
|---------------------------------|-------------------|--------------------------------------------------------------------------------|-------------------------|--------------------------|--------------------------|-------------------------|
| Beaume Degrees.                 | Specific Gravity. | For Dormant Spray, Sp. Gr. 1.030.                                              | 1 to 25, Sp. Gr. 1.010. | 1 to 30, Sp. Gr. 1.0091. | 1 to 35, Sp. Gr. 1.0081. | 1 to 40, Sp. Gr. 1.007. |
| 35.....                         | 1.317             | 9.5                                                                            | 30.5                    | 34.0                     | 38.0                     | 44.0                    |
| 34.....                         | 1.305             | 9.2                                                                            | 29.5                    | 33.0                     | 37.0                     | 42.5                    |
| 33.....                         | 1.293             | 8.7                                                                            | 28.0                    | 31.0                     | 35.0                     | 41.0                    |
| 32.....                         | 1.281             | 8.3                                                                            | 27.0                    | 29.5                     | 33.5                     | 39.5                    |
| 31.....                         | 1.271             | 8.0                                                                            | 26.0                    | 28.5                     | 32.5                     | 37.5                    |
| 30.....                         | 1.260             | 7.6                                                                            | 25.0                    | 27.5                     | 31.0                     | 36.0                    |
| 29.....                         | 1.249             | 7.3                                                                            | 24.0                    | 26.0                     | 30.0                     | 34.5                    |
| 28.....                         | 1.239             | 7.0                                                                            | 23.0                    | 25.0                     | 28.5                     | 33.0                    |
| 27.....                         | 1.228             | 6.6                                                                            | 22.0                    | 24.0                     | 27.0                     | 31.5                    |
| 26.....                         | 1.218             | 6.3                                                                            | 21.0                    | 23.0                     | 26.0                     | 30.0                    |
| 25.....                         | 1.208             | 6.0                                                                            | 20.0                    | 22.0                     | 24.5                     | 28.5                    |
| 24.....                         | 1.199             | 5.6                                                                            | 19.0                    | 21.0                     | 23.5                     | 27.0                    |
| 23.....                         | 1.189             | 5.3                                                                            | 18.0                    | 20.0                     | 22.0                     | 26.0                    |
| 22.....                         | 1.178             | 5.0                                                                            | 17.0                    | 19.0                     | 21.0                     | 24.5                    |
| 21.....                         | 1.168             | 4.6                                                                            | 16.0                    | 18.0                     | 20.0                     | 23.0                    |
| 20.....                         | 1.158             | 4.3                                                                            | 15.0                    | 17.0                     | 19.0                     | 21.5                    |

Apply for British Columbia Bulletin No. 68.

*Victoria, B.C., issued July, 1918.*

This circular has been prepared by J. W. Eastham, B.Sc., Provincial Plant Pathologist, and E. C. Hunt, Assistant Provincial Horticulturist, at the request of the Horticultural Branch.

Copies of this circular may be obtained free of charge on application to the Horticultural Branch, Department of Agriculture, Victoria, B.C., or from local branch offices of the Department.

VICTORIA, B.C.:

Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.  
1918.

